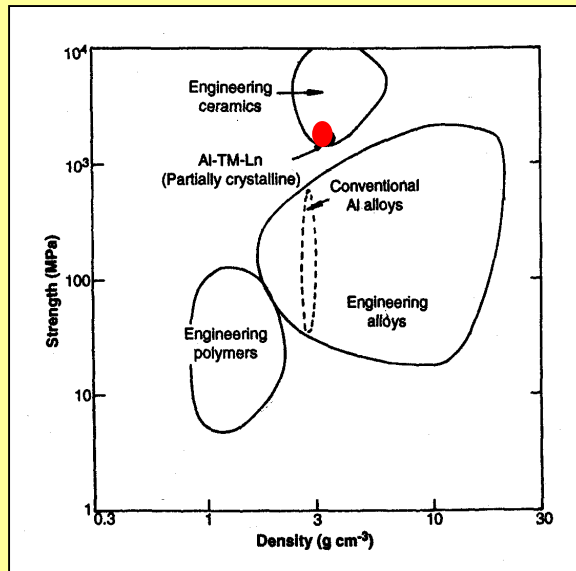


Corrosion Mechanisms in Amorphous-Nanocrystalline Alloys

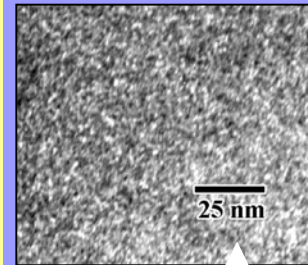
John R. Scully, University of Virginia, DMR Award #0204840

Motivation to study Corrosion Properties of Metallic Glasses

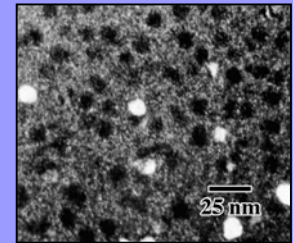
- Aluminum-TM-Ln metallic glasses are novel and potentially very useful:
 - high specific strength (see red dot in figure below)
 - tunable corrosion properties based on composition/ structure
 - resist loss in excellent corrosion resistance typical of the amorphous state when strengthened by forming isolated nanocrystals in amorphous matrix.
- Develop a theory to explain the improved corrosion resistance of partially devitrified glasses.
- Establish structure property relationships which may “break” old materials science “trade-off” between strength and corrosion.



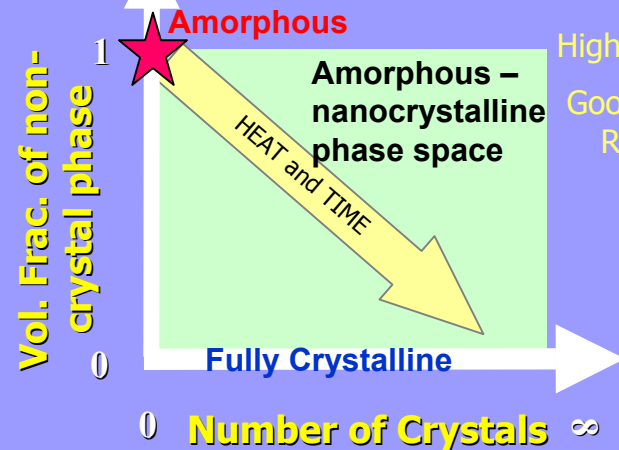
Results



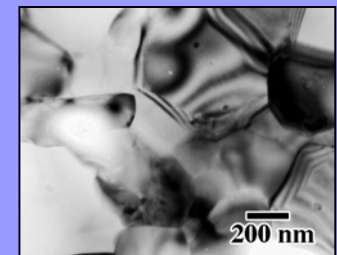
Amorphous
High Strength
Good Corrosion
Resistance



Nanocrystalline
Highest Strength
Good Corrosion
Resistance



Fully Crystalline
Low Strength
Poor Corrosion
Resistance



Corrosion Mechanisms in Amorphous-Nanocrystalline Alloys

John R. Scully, University of Virginia, DMR Award #0204840

Education

- Two undergraduates (Jack Ferrell, Geoff Biddick), two graduate students (Ashley Lucente and Meghan Goldman), two post-doctoral researchers (Francisco Presuel and Necip Unlu) and one high school student (Katie Flinn) have contributed to and been supported by this NSF work.
- John R. Scully is writing a Chapter on Amorphous Metal Corrosion for the American Society for Metals
- John R. Scully chaired the 2004 Gordon Research Conference on Aqueous Corrosion. Student scholarships to attend and present posters were provided to over 30 graduate students from around the world.

Outreach

- An annual short course on electrochemical methods in corrosion is taught for industry participants (20 participants in 2002 and 17 year success of class with over 300 total industrial participants). Graduate research assistants participate in the instruction of the course.
- Materials science and engineering demonstrations and lab tours were given for local Girl Scout Troops and local Elementary School classes to foster an interest in the physical sciences and materials science.

Awards

- Ashley Lucente: First Place - Marcel Pourbaix Award for Best Poster in Corrosion Science, *National Association of Corrosion Engineers 2003*
- Meghan Goldman : Second Place - Marcel Pourbaix Award for Best Poster in Corrosion Science, *National Association of Corrosion Engineers 2003 and 2004*
- John R. Scully: Elected Chairman of the Awards Committee - *National Association of Corrosion Engineers 2005*